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How to Minimize Soil Compaction During Harvest

Mahdi Al-Kaisi

Iowa State University, malkaisi@iastate.edu

Mark A. Licht

Iowa State University, lichtma@iastate.edu

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How to Minimize Soil Compaction During Harvest

Abstract

Rain events during September and October have created challenging conditions not only for timely harvest of corn and soybean crops but also for the impact harvest will have on the soil. These wet conditions coupled with a drop in air temperature will slow harvest operations. Soils are too wet for traffic from heavy equipment, making them susceptible to compaction during harvest operations. When soils are near saturated conditions, heavy equipment loads weaken soil structure where water works as lubricant, leading to the collapse of soil aggregates. This will cause significant surface compaction, rutting, and deep subsoil compaction.

Disciplines

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How to Minimize Soil Compaction During Harvest

October 11, 2018

Rain events during September and October have created challenging conditions not only for timely harvest of corn and soybean crops but also for the impact harvest will have on the soil. These wet conditions coupled with a drop in air temperature will slow harvest operations. Soils are too wet for traffic from heavy equipment, making them susceptible to compaction during harvest operations. When soils are near saturated conditions, heavy equipment loads weaken soil structure where water works as lubricant, leading to the collapse of soil aggregates. This will cause significant surface compaction, rutting, and deep subsoil compaction.

Damage from soil compaction can have significant impact on water infiltration, root development, and ultimately grain yield the following season. It is generally estimated that yield loss due to soil compaction caused by wheel traffic ranges between 10-20% depending on the extent of soil compaction experienced. Over the past decade the size of Iowa farms has increased, leading to larger and heavier equipment. An axle load from a 12-row combine with full grain tank is estimated at 26 tons/axle and a single-axle fully loaded grain cart is estimated at 22 tons/axle.

Avoiding field conditions prone to soil compaction will likely be unavoidable this fall as farmers make an effort to get grain harvested without further field pre-harvest yield losses and worsening grain quality. Soil compaction will be worse the wetter the soil conditions are. Care should be taken to avoid wet and near saturated soil conditions; ideally, field operations would be delayed until soil water is below field capacity. Tillage energy, time, and costs could increase a hundredfold to remediate excessively compacted soils during harvest operations.



Ruts made when harvesting soybean under saturated soil conditions.

Tips to minimize soil compaction during and after harvest

1. **Dedicated travel lanes.** Many combine operators use “on-the-go” unloading into a grain cart to speed harvest. In areas that have received excessive rainfall since Sept. 1, farmers may want to consider having dedicated travel lanes for the grain cart. It has been documented that 60-80% of soil compaction occurs from the first wheel passes, subsequent field operations account for a much smaller amount of compaction.
2. **Don’t run at full capacity.** Reduce the axle loads of both the combine and grain carts by not loading them to full capacity. This may not be an attractive option in high-yielding cornfields and where harvest has already been delayed. This is much easier to implement in soybean where the grain volume is much less than corn. A compromise may be to try and keep axle loads lower in the far reaches of fields and achieve the highest axle loads (full capacity) nearest the end rows where grain will be transported out of the field.
3. **Tire size and inflation pressure.** Use appropriate tire sizes for the conditions and adjust tire air pressure to match the axle load being carried. Larger tires with lower air

pressure provide more surface area, allow for better flotation, and reduced pressure on the soil surface.

4. **Concentrate non-harvest field activities near the point of exit from the field.** While it is tempting to move semi-trailers and tractors with wagons along the field edge as harvest continues, this practice increases compaction along the end rows.
5. **Harvest around the wettest areas.** The wettest areas are the most at risk for soil compaction but are also an accident risk that ultimately could lead to longer harvest delays. Additionally, buried equipment may come with large financial penalties. Come back to these areas later in the fall once the soil conditions are drier or have frozen.
6. **Avoid or minimize tillage.** Remember to hold off tillage operations until soil conditions are drier than field capacity. It is important to consider the soil moisture at the depth of tillage. Tillage in wet conditions results in further compaction and smearing of soil instead of the intended fracturing of the soil. If it is absolutely necessary to cosmetically fill in ruts, use a disk unless soil conditions are dry enough for fracturing of the soil through use of more aggressive implements.




In wet conditions, the best choice farmers can make is to stay away from the field and avoid traffic on wet soil to reduce soil compaction. How you approach fieldwork after a heavy rain event can impact your soil for future growing seasons. More consequences of soil compaction can be found in [Top 10 Reasons to Avoid Soil Compaction](#).

Easy test to check soil conditions for field operations

Most of Iowa's soils have medium textures. For these soils, a simple method of checking soil moisture is the "feel" method. Probing the top 12-18 inches with a hand soil probe to assess the field's soil moisture conditions is time well spent.

Check the soil moisture status by pushing a ribbon of soil from between the thumb and index finger. If it breaks off within one or two inches, the potential for creating compaction is less. However, if the ribbon stretches out to four or five inches, it is still too wet. The chances are good that being in the field under these conditions may cause more problems than it will solve.

Another soil consistency test is to roll soil against the palm of your hand to determine if it will clump and roll or if it is fragile and falls apart. Soil that clumps together is more prone to compaction.

 A photograph showing a soil sample on a light-colored surface. The soil is dark and crumbly, breaking apart easily. A wooden ruler with the 'LOWE'S' logo is placed above the sample for scale.	
Friable soil less compactable condition	
 A photograph showing a hand holding a piece of soil. The soil is dark and appears to be in a more plastic state, not breaking apart as easily as the friable soil.	 A photograph showing a soil sample on a light-colored surface. The soil is dark and appears to be in a more plastic state, not breaking apart as easily as the friable soil. A wooden ruler with the 'LOWE'S' logo is placed above the sample for scale.
Soil near lower plastic state and in compactable condition	

Additional Resources:

[Top 10 reason to avoid soil compaction](#)

[Understanding and Managing Soil Compaction](#)

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Crops:

Corn Soybean

Tags: soil compaction yield loss tillage

Authors:

Mahdi Al-Kaisi *Professor of Soil Management/ Environment*



Mahdi Al-Kaisi is a professor of agronomy and extension soil and water specialist at Iowa State University. His current research and extension in soil management and environment focuses on the effects of crop rotation, tillage systems, residue management, and nitrogen input on soil carbon dynamic...

Mark Licht *Assistant Professor*



Dr. Mark Licht is an assistant professor and extension cropping systems specialist with Iowa State University Extension and Outreach. His extension, research and teaching program is focused on how to holistically manage Iowa cropping systems to achieve productivity, profitability and en...

Mehari Tekeste